



Timika Shafeek-Horton
Deputy General Counsel
550 South Tryon Street
Charlotte, NC 28202

Mailing Address:
DEC 45A/PO Box 1321
Charlotte, NC 28201
704 382 6373 Direct
980 373 8534 Fax

Email Timika.Shafeek-Horton@duke-energy.com

October 1, 2012

The Honorable Jocelyn G. Boyd
Chief Clerk/Administrator
Public Service Commission of South Carolina
101 Executive Center Drive (29210)
Post Office Drawer 11649
Columbia, South Carolina 29211

Re: **Docket No. 2008-251-E**

Dear Ms. Boyd:

Pursuant to the Commission's May 6, 2009 Directive in Docket No. 2008-251-E approving its cost recovery mechanism, Progress Energy Carolinas, Inc. (PEC) submits the attached report summarizing the results of the 2010 and 2011 Program Year evaluation, measurement and verification (EM&V) for its Home Advantage Program. PEC's request to terminate this program was approved by the Commission in its Directive, in Docket No. 2009-190-E, issued on January 11, 2012.

Sincerely,

A handwritten signature in black ink that reads 'Timika Shafeek-Horton'.

Timika Shafeek-Horton
Deputy General Counsel

Attachment

cc: Courtney Edwards
John Flitter

Progress Energy Service Company, LLC
P. O. Box 1551
Raleigh, NC 27602



2010 AND 2011 EM&V REPORT FOR THE HOME ADVANTAGE PROGRAM

**Prepared for:
Progress Energy Carolinas**

**Prepared by:
Navigant Consulting, Inc.**



September 27, 2012



Prepared for:
Progress Energy Carolinas
Raleigh, North Carolina

Presented by
Stuart Schare
Director

Navigant Consulting, Inc.
1375 Walnut Street
Suite 200
Boulder, CO 80302
phone 303.728.2500
fax 303.728.2501

www.navigant.com

Primary contributing authors:

David Basak
Carol Mulholland

Table of Contents

Executive Summary.....	1
1. Introduction.....	3
1.1 Reported Participation and Savings.....	3
1.2 Objectives of the Evaluation.....	5
1.3 Evaluation Methods.....	5
2. Program Impacts	6
2.1 Gross Savings	6
2.2 Net Savings.....	7
3. Recommendations	9

Executive Summary

This report addresses evaluation, measurement, and verification (EM&V) activities for the Home Advantage (HA) Program for Program Year 2010 (PY 2010) and Program Year 2011 (PY 2011) projects, defined as those receiving rebates during the 2010 and 2011 calendar year. Through the HA program Progress Energy Carolinas (PEC) seeks to transform the new homes market by providing incentives to builders that construct homes to ENERGY STAR standards, as well as for HVAC system efficiency upgrades. The program generates energy and peak demand reductions by offering rebates for the following residential measures and equipment, focused on heating and air conditioning savings:

1. HA Package (ENERGY STAR whole house qualifications)
2. Air Source Heat Pump
3. Central Air Conditioner
4. Geothermal Heat Pump

The primary purpose of the EM&V assessment was to verify net annual energy and peak demand impacts associated with 2010 and 2011 HA activity. Secondary objectives included:

- Assessing the status of Navigant's PY 2009 report recommendations
- Evaluating the net-to-gross ratio currently adopted by PEC for program savings

Evaluation Methods

The PY 2010-11 EM&V assessment builds on the PY 2009 effort, in which Navigant verified the accuracy of the assumed savings values for each measure, and recommended several changes. Navigant's PY 2010-11 assessment adopted these same deemed values because the program continued to operate with the same rules and the deemed savings values were still applicable. New EM&V activities included confirming the adoption of recommendations from the PY 2009 report and assessing of the appropriateness of the current net-to-gross (NTG) ratio utilized by PEC.

Program Impacts

EM&V findings present gross savings as reported by PEC and verified by Navigant, and also net savings, accounting for free ridership and spillover. The evaluation team verified the PEC reported savings by individually analyzing both PY 2010 and PY 2011 program year transactions by measure category, ensuring that the appropriate deemed savings values were applied. Navigant then applied the NTG ratio of 0.90 (used by PEC and affirmed via the EM&V effort) to each measure category and to the program as a whole.

Table ES-1 shows the program-level verified net impacts for energy and summer/winter¹ peak demand savings for 2010 (1,883 MWh and 602/680 kW) and 2011 (3,753 MWh and 1,202/1,361 kW).

¹ The EM&V team verified the appropriate use of the recommended deemed savings values for summer coincident demand as a part of the PY 2009 efforts but did not verify winter coincident demand savings.

Table ES-1: Verified Program Impacts for PY 2010 and PY 2011

	PY 2010			PY 2011		
	Annual Energy Savings (MWh)	Summer Coincident Demand Savings (kW)	Winter Coincident Demand Savings ¹ (kW)	Annual Energy Savings (MWh)	Summer Coincident Demand Savings (kW)	Winter Coincident Demand Savings ¹ (kW)
Verified Gross Savings	2,092	669	755	4,170	1,335	1,512
Net-to-Gross Ratio	0.9					
Verified Net Savings	1,883	602	680	3,753	1,202	1,361

¹The EM&V team verified the appropriate use of the recommended deemed savings values for summer coincident demand as a part of the PY 2009 efforts but did not verify winter coincident demand savings.

Source: HA Program database and Navigant analysis

Recommendations

Based on the evaluation efforts for PY 2010 and PY 2011, Navigant characterized the status of the PY 2009 report recommendations. The team found that PEC fully adopted the recommendation from the PY 2009 evaluation that most directly affects savings values—that PEC maintain the HA program package deemed savings figures, but that the advanced HVAC savings numbers be revised downward. Other recommendations were adopted as appropriate and relevant.

1. Introduction

This report addresses evaluation, measurement, and verification (EM&V) activities for the Home Advantage (HA) Program for Program Year 2010 (PY 2010) and Program Year 2011 (PY 2011) projects, defined as those receiving rebates during the 2010 and 2011 calendar year. Through the HA program Progress Energy Carolinas (PEC) seeks to transform the new homes market by providing an incentive to builders that construct homes to ENERGY STAR standards, as well as for HVAC system efficiency upgrades. Builders receive a \$400 per home cash incentive for homes with an ENERGY STAR envelope. The builder may receive an additional prescriptive incentive of \$300 for Air-Air Heat Pump upgrades to 15 SEER or higher; \$300 for Central AC upgrades to 15 SEER or higher; and \$600 for Geothermal Heat Pump upgrades to 17 EER or higher.

The basic program process has several steps: (1) a qualified builder constructs a home to program standard; (2) the home is inspected by a Home Energy Rating System (HERS) rater for compliance; (3) the builder or developer sends the incentive application to PEC for review; (4) the application is reviewed by program staff and entered into PEC's database tracking system; and (5) PEC processes the rebate. PEC staff conducts spot checks on approximately 5% of the homes.

PEC implements the program and is responsible for all aspects of program management including marketing, rebate processing, customer service oversight, quality control, training, and database management.

1.1 Reported Participation and Savings

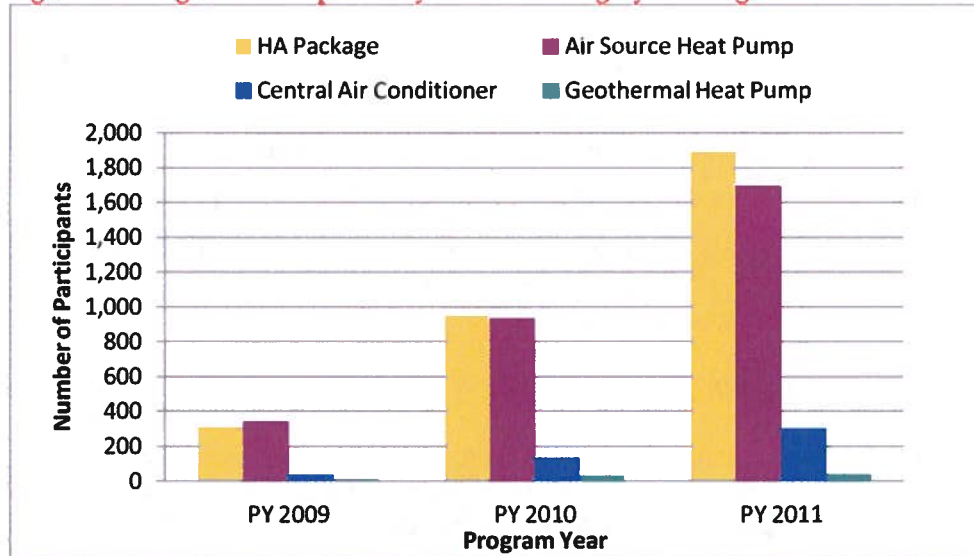
The HA program generates energy and peak demand reductions by offering rebates for the following residential measures and equipment, focused on heating and air conditioning savings:

1. HA Package (ENERGY STAR whole house qualifications)
2. Air Source Heat Pump
3. Central Air Conditioner
4. Geothermal Heat Pump

PEC maintains a program-tracking database that identifies key characteristics of each project, including participant data, measures installed, and estimated energy and peak demand reductions² based on assumed ("deemed") savings values. Although the participation is lower than originally projected due to the depressed economy, the HA program participation has continued to escalate each year. Figure 1-1 shows the steady increase in participation from PY 2009 thru PY 2011.

² "Peak demand reductions" are defined as the reduction in peak power demand that is coincident with the utility system peak.

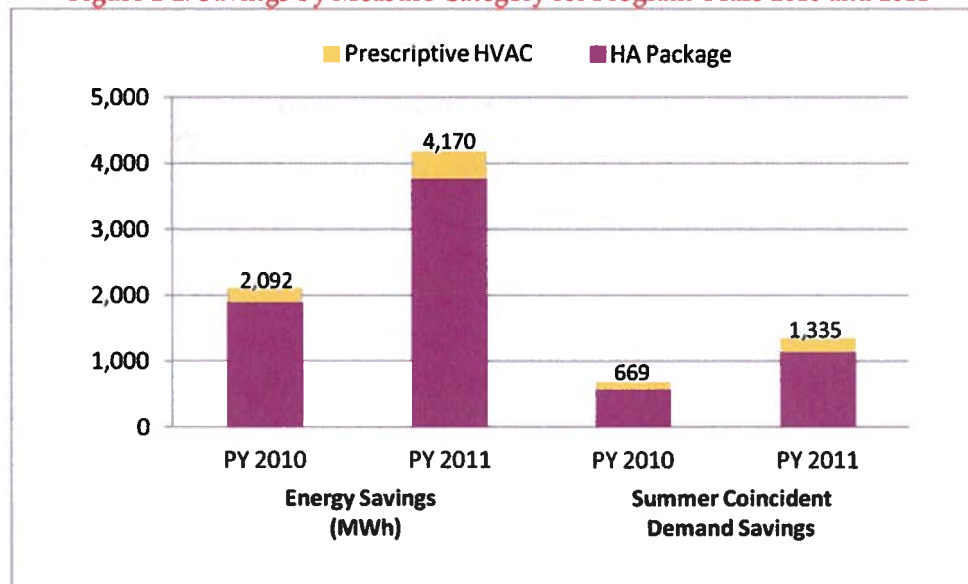
Figure 1-1: Program Participation by Measure Category for Program Years 2009 - 2011



Source: HA Program database and Navigant analysis

According to the HA database, the savings from PY 2010 measures totaled 2,092 megawatt-hours (MWh) with a summer peak demand reduction of 669 kW. PY 2011 savings increased significantly to 4,170 MWh with a summer peak demand reduction of 1,335 kW. Figure 1-2 shows the reported gross energy and demand savings by measure category for both program years (prescriptive HVAC includes central air conditioners and heat pumps).

Figure 1-2: Savings by Measure Category for Program Years 2010 and 2011



Source: HA Program database and Navigant analysis

1.2 Objectives of the Evaluation

The primary purpose of this EM&V report is to verify net annual energy and peak demand impacts associated with 2010 and 2011 HA activity. Secondary objectives include:

- Assessing the status of Navigant's PY 2009 report recommendations
- Evaluating the net-to-gross ratio currently adopted by PEC for program savings

This EM&V cycle is less rigorous than that performed for PY2009 since much of that effort is applicable to PY2010 and PY2011. Furthermore, PEC is planning to replace the HA program with a new residential new construction offering beginning in 2013.

1.3 Evaluation Methods

PEC's program tracking database provided program-level savings values for energy and peak demand ("reported gross savings") based on program participation data and assumed per-participant savings, or "deemed savings", values. In the PY 2009 report the EM&V team verified the accuracy of the assumed savings values for each measure, and recommended several changes. Navigant's PY 2010-11 assessment adopted these same deemed values because the program continued to operate with the same rules and the deemed savings values were still applicable.

New for PY2010-11, the EM&V team performed the following activities:

1. **Ensuring appropriate adoption of recommendations from PY 2009 EM&V report** - Navigant began the evaluation by verifying program changes recommended in the PY 2009 EM&V report. This entailed reviewing the program tracking database to ensure the adoption of recommended deemed savings values. Section 3.1 details the complete review of program changes and addresses each recommendation independently.
2. **Assessing appropriateness of PEC's assumed net-to-gross ratio** - The EM&V team conducted an assessment of the net-to-gross ratio currently used by PEC and compared it to other similar programs across the country. Section 2.2 details the findings from the analysis and compares the results to PEC's assumed net-to-gross ratio.

2. Program Impacts

The impact evaluation for PY 2010 and PY 2011 began by verifying that the recommended deemed savings values from the PY 2009 EM&V report were appropriately applied to program participation data to estimate gross energy and peak demand impacts. Next, the EM&V team conducted a review of PEC's net-to-gross ratio compared with other similar programs across the country. As discussed below, Navigant concludes that PEC's assumed NTG ratio of 0.90 is reasonable, and perhaps conservative, and should be applied to the reported gross savings values identified above in Section 1.1. Navigant estimates verified net savings at nearly 1.9 GWh in 2010 and 3.8 GWh in 2011.

Program impacts are summarized for 1) gross savings, and 2) net savings, accounting for free ridership and spillover.

2.1 Gross Savings

PEC maintains a program-tracking database that identifies key characteristics of each project, including participant data, measures installed, and estimated energy and peak demand reductions based on assumed ("deemed") savings values. The evaluation team verified the PEC reported savings by individually analyzing both PY 2010 and PY 2011 program year transactions by measure category. EM&V-verified savings for PY 2010 measures totaled 2,092 megawatt-hours (MWh) with a summer peak demand reduction of 669 kW. PY 2011 savings increased significantly to 4,170 MWh with a summer peak demand reduction of 1,335 kW. Table 2-1 shows the verified gross energy and demand savings by measure category for both program years.

Table 2-1: PY 2010 and PY 2011 Verified Gross Energy Savings and Demand Reduction

Measure Category	PY 2010		PY 2011	
	Annual Energy Savings (MWh)	Coincident Peak Demand Savings (kW)	Annual Energy Savings (MWh)	Coincident Peak Demand Savings (kW)
HA Package	1,896	578	3,780	1,153
Air Source Heat Pump	171	81	360	171
Central Air Conditioner	5	5	6	7
Geothermal Heat Pump	20	4	24	5
Total ^a	2,092	669	4,170	1,335

a. The sum of the verified annual energy savings across all measure categories may not equal total verified savings shown, due to rounding. The EM&V team verified the appropriate use of the recommended deemed savings values from PY 2009. Therefore, the gross savings values presented here are the same as those reported in the tracking database, implying a 100% realization rate.

Source: HA Program database and Navigant analysis

2.2 Net Savings

Savings attributable to efficiency programs are often adjusted for free ridership (savings that would have occurred even in the absence of the program) and spillover (additional savings influenced by the program but not captured in program records) and are commonly expressed as a net-to-gross (NTG) ratio applied to the verified gross savings values. PEC currently uses a NTG of 0.90 which is lower than the average of figures Navigant, and other evaluators, have developed for other residential new construction programs across the country. The average NTG ratio of the eight programs reviewed was 1.04, as shown in Table 2-2 below. Although this research revealed that typical NTG values for residential new construction programs are higher than that used by PEC, we recommend PEC take a conservative approach and continue to apply the 0.90 NTG ratio to the HA program.

Table 2-2: NTG Ratio Comparison for Residential New Construction Programs Across the US

Utility/State	Year	NTG Ratio
APS - Arizona	2011	1.39
EmPOWER - Maryland	2011	0.84
Massachusetts	2010	1.12
Massachusetts	2011	1
Michigan	2011	0.9
NYESLH - New York	2011	1.17
PECO - Pennsylvania	2011	0.87
PSO - Oklahoma	2010	1
<i>Average</i>	-	1.04
PEC – Current Assumption	2010 - 2011	0.90
EM&V Recommendation	-	0.90

Source: Navigant analysis

The EM&V team applied this NTG ratio to gross savings from each program year. Table 2-3 shows the verified net savings of 1,883 MWh for PY 2010 and 3,753 MWh for PY 2011.

Table 2-3: PY 2010 and PY 2011 Verified Net Energy Savings

Program Year	Verified Gross Energy Savings (MWh) [A]	Net-to-Gross Ratio [B]	Verified Net Energy Savings (MWh) [C = A x B]
PY 2010	2,092	0.90	1,883
PY 2011	4,170	0.90	3,753

Source: HA Program database and Navigant analysis

Table 2-4 shows the verified net summer coincident demand savings of 602 kW for PY 2010 and 1,202 kW for PY 2011.

Table 2-4: PY 2010 and PY 2011 Verified Net Summer Coincident Demand Savings

Program Year	Verified Gross Coincident Demand Savings (kW) [A]	Net-to-Gross Ratio [B]	Verified Net Coincident Demand Savings (kW) [C = A x B]
PY 2010	669	0.90	602
PY 2011	1,335	0.90	1,202

Source: HA Program database and Navigant analysis

3. Recommendations

For the PY 2009 evaluation, Navigant examined PEC's deemed savings estimates for both the HA program package and the advanced HVAC savings options. The project team recommended that PEC maintain the HA program package deemed savings figures, but that the advanced HVAC savings numbers be revised downward. Navigant reviewed the status of PEC's compliance with these recommendations in response to a NCUC's inquiry whether PEC has implemented this recommendation and others related to program impacts. The following discussion includes both the original recommendations themselves and Navigant's determination about the extent to which the recommendations have been implemented. The EM&V team reviewed PEC's database and interviewed PEC staff to develop these findings.

Recommendation #1: Factor in home size, region, and HVAC system size and type whenever possible. Original deemed savings values were not adjusted for home size, region, or HVAC system size and type (with the exception of the Advanced HVAC program). Because these factors can affect actual savings, the EM&V team recommends that they be accounted for in future impact analysis where possible – and that PEC take steps to change them before the full PY2010 impact evaluation.

Navigant finding: Due to the lower-than-expected level of program activity and PEC plans to replace the HA program with a new residential new construction program offering, the evaluation team did not investigate the effects of home size, region, and HVAC system sizes and type on the deemed savings calculations.

Recommendation #2: For the HA program, the EM&V team recommends using the adjusted HVAC-system-based energy savings values. We also recommend using climate and HVAC system-specific information in subsequent impact evaluations. This information, along with information about the home (such as the HERS rating) would help distinguish savings between home characteristics and varying SEER ratings of units.

Navigant finding: PEC has not conducted any further impact evaluations using climate and HVAC system-specific information. Navigant believes that investing additional time and expense for an extensive evaluation is not justified due to savings values no longer being applicable after the planned transition to the replacement residential new construction program.

Recommendation #3: For the Advanced HVAC program measures, the EM&V team recommends using the unit savings values listed in Table 6-1 (of the 2009 EM&V Report for the Home Advantage Program, dated August 29, 2011). These values require unit type, size, and the total number of units of each type to establish a savings estimate.

Navigant finding: The evaluation team's database review shows that PEC adopted the recommended savings per unit. Table 3-1 shows these figures.

Table 3-1: Revised Savings Numbers

Measure	Original PEC Deemed Savings (kWh/unit/yr)	Recommended Savings (kWh/unit/yr)	PEC Adopted Savings (kWh/unit/yr)
Air Source Heat Pump (15 SEER+)	779	274	274
Central Air Conditioner (15 SEER+)	314	127	127
Geothermal Heat Pump (17 EER+)	165	660	660

Source: HA Program database and Navigant analysis

Recommendation #4: Use the EM&V team derived deemed savings values for the HA program package and for the advanced HVAC measures. Because the current estimated energy savings values for the HA program package are bracketed by the results of region specific studies, the EM&V team believes the original PEC deemed savings estimates are appropriate. For advanced HVAC, the PEC estimated savings are not consistent with our review of secondary source materials.

Navigant finding: Navigant did not provide a recommendation for action; therefore no further evaluation is necessary.

Recommendation #5: Include the square footage of all properties in the main database. Future evaluations will be easier since this crucial data will be more easily accessible.

Navigant Finding: PEC is tracking the square footage of all properties for evaluation purposes in the V-Tech system, which tracks program details.

Recommendation #6: Conduct a building characterization study using eQuest. Because the ENERGY STAR home requirements will be changing in 2011, the EM&V team does not recommend spending additional resources determining better values to use for the PY2009 HA program package savings. We do recommend conducting a thorough building characterization study including site visits, as well as modeling homes compliant with the new requirements using eQuest. Along with the modeling, a sensitivity analysis on modeling inputs should be conducted to determine where to allocate resources gathering data.

Navigant Finding: Because ENERGY STAR 3.0 was pushed back to July 2012, this recommendation is no longer relevant for the HA program.

